WHAT IS CLAIMED IS

1. A rate control method for real-time video communication by using a dynamic rate table comprising the steps of :

(a) establishing a dynamic rate table under the off-line condition,

(b) estimating the target coding bit count B_T of the current frame;

(c) performing initialization to the current frame, of which the initialization including the steps of calculating and recording SAD value and motion vector of every MB, categorizing the MBs into compensable and uncompensable MBs, categorizing the uncompensable MBs into uncompensable inter-coding and intra-coding MBs, calculating the numbers of the uncompensable inter-coding and intra-coding MBs, and recording the numbers into the parameters N_{intra} and N_{inter} respectively;

(d) estimating the number of bits b_k allocated to the kth uncompensable MB based on SAD_{MB_k} ;

(e) searching the dynamic rate table by using b_k and SAD_{MB_k} of the current MB to obtain an optimal quantization parameter QP_k , and then adjusting the QP_k such that the difference value between QP_k and QP_{k-1} (the QP of the previous MB) is not greater than 2;

(f) using the resulting QP_k to quantize and encode the current MB, and then using actual coding bit count to update the dynamic rate table.

2. The method of claim 1, wherein the dynamic rate table is a 2-dimensional matrix $b[SAD_{MBk}][QP]$; wherein the SAD_{MBk} denotes the SAD value of the kth MB, and the SAD is an integer in the range of (SAD_{min}, SAD_{max}); the QP represents quantization parameter with $QP=1,2,….,31$; the entry of the matrix represents the estimate of the coding bit counts of a MB (with encoding complexity SAD_{MBk}) that is quantized with a particular QP value.

3. The method of claim 2, wherein the training process of establishing the dynamic rate table comprises the steps of:

(a) feeding training video data into a video encoder on a MB-by-MB basis;

(b) calculating the SAD value of the input MB, and encoding them by using QP values from 1 to 31 respectively;

(c) recording the actual coding bit counts of the input MB after being quantized by each QP value;

(d) repeating the above steps for all MBs, and take the average of the actual coding bit counts for each (SAD, QP) pair, and then store the averages values into the matrix $b[SAD_{MBk}][QP]$ until all entries of the matrix have been finished, the rate table is established.

4. The method of claim 1, wherein the target coding bit counts B_T of the current input frame is estimated by using the following equation:

$$B_T = \frac{R}{F} - \Delta$$

, wherein Δ is defined below :

$$\Delta = \begin{cases} \dfrac{2*W}{F}, & W > Z*M \\ W - Z*M, & \text{otherwise} \end{cases}$$

, wherein $W = max(W_{prev} + D - R/F, 0)$, wherein D is actual number of bits used for encoding the previous frame, W_{prev} is the previous number of bits in buffer, R is channel rate, and F is frame rate.

5. The method of claim 1, wherein the estimate of b_k is based on the ratio of the SAD value of the kth MB to the sum of SAD values of all MBs.

6. The method of claim 5, wherein the number of bits b_k allocated to the kth uncompensable MBs in a frame is calculated by using the following equation:

$$b_k = \frac{B_{ava} \times SAD_{MB_k}}{\sum\limits_{k=1}^{N} SAD_{MB_k}}$$

, wherein B_{ava} is the total number of the bits allocated to the uncompensable MBs; SAD_{MBk} is the SAD value of the kth MB; N is the total number of uncompensable MBs in a frame.

7. The method of claim 6, wherein the number of bits B_{ava} is estimated by using the following equation:

$$B_{ava} = B_{code} - B_{h-intra} * N_{intra} - B_{h-inter} * N_{inter}$$

, wherein $B_{h-intra}$ is the average header bit counts for intra MBs that have been encoded; $B_{h-inter}$ is the average header bit counts for inter MBs that have been encoded; N_{intra} is the number of remaining intra MBs; N_{inter} is the number of remaining inter MBs.

8. The method of claim 7, wherein $B_{h-intra}$ and $B_{h-inter}$ are calculated in a recursive manner by using the following equations:

$$B_{h-intra}^{j} = \frac{1}{j}(B_{h-intra}^{j-1} \times (j-1) + b_{h-intra}^{j})$$

$$B_{h-inter}^{j} = \frac{1}{j}(B_{h-inter}^{j-1} \times (j-1) + b_{h-inter}^{j})$$

, wherein $B_{h-intra}^{j}$ is the average header bit counts over j intra MBs (the first MB to the jth MB);

$b_{h-intra}^{j}$ is the header bit counts for the jth intra MBs; $B_{h-inter}^{j}$ is the average header bit counts over j inter MBs (the first MB to the jth MB); $b_{h-inter}^{j}$ is the header bit counts for the jth inter MBs.

9. The method of claim 7, wherein the total number of bits allocated to uncompensable MBs is calculated through the following equation:

$$B_{code} = B_T - B_{uncode} - B_{PH} - B_{GOBH}$$

, wherein B_{PH} is the bit counts for picture header; B_{GOBH} is the bit counts for GOB headers.

10. The method of claim 7, wherein the partial non-texture information bits for a frame is calculated by using the following equation:

$$B_{uncode} = \sum_{m=1}^{M} \left(B_{COD}, B_{COD} + B_{MCBPC} + B_{CBPY} + B_{MVD}, B_{MVD}, 0 \right)$$

, wherein M is the total number of MBs in a frame; (X, Y, Z, 0) means to select one from X, Y, Z and 0 depending on the coding modes, where X and Y correspond to the compensable type, Z corresponds to the uncompensable inter-coding, and 0 corresponds to the uncompensable intra-coding; B_{COD} is the number of bits for COD signal; B_{MCBPC} is the number of bits for MCBPC signal; B_{CBPY} is the number of bits for CBPY signal; B_{MVD} is the number of bits for MVD.

11. The method of claim 1, wherein the optimal quantization parameter QP_k is obtained by minimizing the difference between b_k and $b[\text{SAD}_{MBk}][QP]$.

12. The method of claim 1, wherein the dynamic rate table is automatically updated by using the actual coding bit counts b_k' of the current MB on a MB-by-MB basis every time after each macroblock being processed.

13. The method of claim 12, wherein the estimated coding bit counts corresponding to every quantization parameter in the dynamic rate table are updated by using the following equation:

updated coding bit count $= b[\text{SAD}_{MBk}][QP] + sb[\text{SAD}_{MBk}]$

, wherein $sb[\text{SAD}_{MBk}]$ is a one-dimensional shift array and each SAD value corresponds to an entity of the shift array;

the $sb[\text{SAD}_{MBk}]$ is updated by using the following equation:

$sb[\text{SAD}_{MBk}] = (b_k' + sb[\text{SAD}_{MBk}] - b[\text{SAD}_{MBk}][QP]) / 2$

14. The method of claim 1, further comprises the steps of using the QP value to

determine *PQUANT* or *GQUANT* while the process occurs at the beginning of a GOB;

(a) if no uncompensable MB exists in the GOB, setting *GQUANT* be any integer in the range of 1 to 31;

(b) if there is only one uncompensable MB in the GOB, setting *GQUANT=QP*;

(c) if there are at least two uncompensable MBs in the GOB, determining the *GQUANT* by using the following equation in accordance with the *QP* values of the first two uncompensable MBs:

$$GQUANT = \begin{cases} QP_1 + 2 & if \ \ QP_2 - QP_1 \geq L, \\ QP_1 & if \ \ -L < QP_2 - QP_1 < L \\ QP_1 - 2 & if \ \ QP_2 - QP_1 \leq -L \end{cases}$$

, wherein L is a positive integer.